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Title:	Release system for ski bindings
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Release System for Ski Bindings

The invention relates to skis and relates in particular to a release system for ski bindings, which [sic] with a mechanical clamp-in system through which the ski can be releasably secured on the boot of a skier.

Ski safety bindings are known which establish the connection between a ski of a skier and the boot until, via the ski and the boot forces act onto the legs and joints, which forces exceed the still safe limit values. If large forces occur, the bindings release the boot from the skis in order to avoid injuries when falling. However, no binding exists which releases uniformly well with forces from all possible directions and even if there were one, the main problem would still not be solved, that is entailed in all currently available bindings. This problem comprises that the decision whether or not to disengage or release the binding or not to disengage or not to release the binding is made by the release system of the ski and it therefore is a function of various variables - namely the magnitude, the directions and the types of forces to which the release system is exposed.

The main difficulty in the construction of bindings to be disengaged or to be released by a force comprises that it is difficult to find a suitable force which is to effect the disengagement or release. The problem of finding a correct balance between a suitable binding and an effective protection against injuries, can only be solved with difficulty thereby that the available force-safety bindings are reconstructed. It is therefore proposed to provide a release system for ski bindings which is actuated by the skier himself since he can completely recognize all circumstances which occur in an instantaneous situation.

One problem with such a system comprises that it is difficult to transfer the decision

to the release system. According to US 3 246 907 magnetic ski bindings are known, which are disengaged or released by the skier thereby that a switch on a ski pole is actuated. However, the signal is transmitted through electric conductors which extend from the ski pole through the clothing and the boot to the bindings. Consequently, the ski boots, the skis and the ski poles are physically connected with one another, which is unfavorable for reasons of costs, suitability, comfort, safety and reliability during operation of the signal connection configuration. In addition, through any error in the magnet actuation configuration an actually dangerous situation for the skier is generated.

It is therefore the task of the invention to provide a safely operating release system for ski bindings.

This task is solved with a release system of ski bindings of the above cited type through a receiving device disposed on the ski which responds to a transmitted release signal by releasing the clamp-in system, and through a transmitting device, which is provided spaced apart from the receiving device and disposed such that it can be actuated by the skier and upon actuation outputs the release signal.

Embodiments of the release system for ski bindings according to the invention will be described by example in the following in conjunction with drawings. Therein depict:

Fig. 1 a view of a portion of an embodiment of the ski bindings,

Fig. 2 a view of the ski binding according to Figure 1 from above,

Fig. 3 a section along line 3-3 in Figure 1,

Fig. 4 a section along line 4-4 in Figure 1,

Fig. 5 a view of the side of the upper portion of a ski pole, which comprises a transmitter for the ski binding,

Fig. 6 a side view of a portion of another embodiment of the ski binding,

Fig. 7 a view of the ski binding according to Figure 6 from above,

Fig. 8 a section along line 8-8 in Figure 6,

Fig. 9 a section along line 9-9 in Figure 6,

Fig. 10 a schematic circuit diagram of the high-frequency transmitter for ski bindings,

Fig. 11 a schematic circuit diagram of a high-frequency receiver for ski bindings,

Fig. 12 a schematic circuit diagram of a sound (sonar) transmitter for ski bindings, and

Fig. 13 a schematic circuit diagram of a sound receiver for ski bindings.

In Figures 1 to 5 is depicted a release system 10 to be actuated from a distance, which is disposed such that it releases a safety front jaw 12 fastened on a ski 14. In the drawings only the corresponding portion of the binding and of the ski is shown for reasons of saving space. It should, however, be pointed out that the portions not shown are developed in the conventional manner and does not contribute to an understanding of the invention and that the second ski is developed in a manner corresponding to the first ski.

A step-in safety binding developed in the conventional manner is depicted through the safety front jaw 12, and it comprises a front part 16, which rests closely on the front portion of a boot 18 directly via its projecting sole 20. The front portion of the boot 18 is normally in the position shown in Figure 1 and pressure is exerted onto the heel of the boot, which is located in an associated disengagable step-in heel holding part (automatic heel mechanism), which is not shown and which holds the boot 18 on the binding 12. The boot 18 is released from the binding when a certain force is exerted onto the front jaw 16 or the heel holding part (not shown), which, for example, effects a torquing of the front jaw 16 relative to the ski, whereby the boot 18 is released. It is understood that a release by the heel holding part also takes place at a certain force.

The release system 10 does not interfere with this normal release function of binding 12 at an occurring force, but rather permits the skier to release the binding 12, if he considers such necessary. A skier is confronted with occasions in which he can estimate that he will encounter difficulties, such as, for example, in the event of an unavoidable fall and in which he should detach his binding before release forces act onto the binding. In these cases it was found to be advantageous if the skier can free himself as rapidly as possible from his skis in order for injuries to be kept as low as possible. This option is given through the described ski binding.

The release system 10 comprises a device 22 (Figure 5 and 10), through which a high-frequency signal is formed and transmitted, which is picked up by a receiving device 24. The receiving device 24 picks up the signal and processes it and initiates the actuation of a mechanical connection mechanism 26, whereby the front jaw 16 is pushed away from the front portion of the boot 18, whereby, in turn, the boot is released from the binding 12.

The connection part 26 comprises a displaceable fastening plate 28, on which the front jaw 18 is fastened with the aid of bolts 30. The plate 28 slides on rails 32

(Figure 4) screwed tightly on the surface of ski 14. The plate 28 is guided along rails 32 with the aid of an applied inverted T-form shoe 34, which slides on complementary inner faces of rails 32.

Plate 28 is moved along tracks 32 with the aid of an adjustable rod 36, which is connected at its one end with the front portion of the plate 28, and which at its other end is connected with an unlatching mechanism 38 (Figure 3), disposed in a housing 40. As can be seen in conjunction with Figure 1, rod 36 is pushed downwardly in order for the front jaw 16 to be brought with the aid of a U-form lever arm 42, disposed with its one end rotatably on the ski 14, into a position, in which the boot 18 is secured. The lever arm 42 is connected with rod 36 by two connecting parts 44, which are rotatably connected with the lever arm 42 on its one ends and which, with their other ends, are connected with a spring stop 46, which is displaceable on rod 36. The displaceable stop 46 is fastened with a spring stop 48, fastened on rod 36, by a coil spring 50, which encompasses the rod 36 and at its ends is connected with stops 46 and 48.

Therewith the rotatable lever arm 42, if it is moved in Figure 1 in the clockwise direction, slides the rod 36 downwardly such that the front jaw 16 is guided into the position depicted in Figure 1. This movement is interrupted if the rod 36 is latched through the latching and unlatching system 38. The lever arm 42 in this case is rotated in the anticlockwise direction until it rests again on the surface of ski 14 and covers the connecting parts 44, the stops 46 and 48 and the spring 50, such that these are protected against ice and snow. Through this movement of the lever arm 42 the spring 50 is also compressed against the first stop 48 and the rod 36 is prestressed for a movement upwardly (as can be seen in Figure 1).

The upper end of rod 36 is located in housing 40, in which it is latched or released by a slide head 52 of the latching mechanism 38 thereby that it either does or does not engage a recess 54 in rod 36. The slide head 52 is disposed on a rotatable slide bar

56 which is held by a latching bar 58 with the rod 36 in the latched position. The latching bar 58 is rotatably supported between its ends and has a recess 60, through which the free end of the slide bar 56 is received and through which it is prevented that the slide bar 56 can be rotated away from the laterally fastened rod 36.

When the latching and unlatching mechanism 38 is in the state depicted in Figure 3, the rod 36 is prevented from becoming displaced in the axially direction upwardly, whereby the front jaw 16 remains engaged with the boot 18. When the skier triggers a signal for the release of the binding, it is acquired by the receiving device 24, whereby a coil 62 is excited which is connected with the latching bar 58. The coil 62 rotates the latching bar 58 in the counterclockwise direction whereby the end of the slide bar 56 is released. The slide bar 56 is rotated through the prestress of a spring 66 onto the slide bar 56 away from rod 36, whereby the slide head 52 no longer engages the recess 54 of rod 36. Rod 36 is subsequently released for a movement in the axial direction upwardly, and binding 12 is detached.

With a momentary delay the coil 62 is subsequently no longer supplied with power and the latching bar 58 and the slide bar 56 are prestressed with the aid of springs 64 or 66 such that they assume their latching positions. When the lever arm 42 is swivelled in the clockwise direction, as has already been described earlier, the recess 54 in rod 36 moves downwardly until the slide head 52 engages it and thus latches the rod 36.

Coil 62 is actuated by the receiving device 24. The receiving device 24 is located at the upper end of housing 40, as is represented in Figure 2, and it is separated from the latching and unlatching mechanism 38 by a plate 70. For a description of the operational mechanism of the receiving device 24 reference is made to Figure 11. The receiving device 24 comprises a signal receiver 72, which acquires a signal from the transmitter 22 and it conducts the signal, which comprises a carrier and a superimposed signal, to a high-frequency amplifier and filter 74, which filters and

amplifies the incoming signal. The carrier component of the signal is removed by a demodulator 76, such that only the low-frequency portion remains. The low-frequency portion of the signal is again filtered with the aid of a filter 78 and rectified with the aid of a rectifier 80 such that a suitable signal is generated which can actuate a power switch 82. The power switch 82 is interconnected between a current source 84, comprising batteries, and coil 62. When the power switch 82 is actuated, it closes such that therewith the electric circuit between the batteries 84 and the coil 62 is closed.

After a certain time the power switch opens again automatically whereby to the coil power is no longer supplied. In the power circuit is also disposed a switch 86 to be actuated manually, which can be opened, in order for the actuation of the coil to be prevented for example when the ski are not used.

The components of the receiving device 24, for example components 74, 76, 78, 80 and 82, like the solid state power switch 82, are well known and commercially available. It is consequently not necessary to describe their structure and operational function in further detail.

The high-frequency signal, which is initiated by the skier in order to attain a release from the binding, is formed with the aid of a transmitter device 22, which, as partially depicted in Figure 5, is installed in a ski pole, and the electric circuit in connection with it is described in Figure 10, which in the following will be discussed further. The transmitter device 22 comprises a current source 90 which comprises batteries and which is connected with a signal generator and transmission circuit 92 and which generates and supplies a signal for a transmitter 94. A switch 96 to be actuated manually initiates the generation and transmission of a signal.

The switch 96 comprises a switch actuation part 98 (Figure 5) which projects from one of the finger grips 99 of the hand grip 100 of a ski pole 102. When the switch

actuation part 98, as shown in Figure 5, projects from the hand grip 99, the switch 96 is closed. When a skier is skiing and grasps the hand grip 100 with his hand, therein in particular with his index finger grasps the finger grip 99, the switch actuation part 98 is moved and is located in the inner position shown in Figure 5 in which the switch 96 is held open, as is shown in Figure 10. If the skier wishes the release from his binding, it is only necessary to detach his finger from the finger grip 99 and the switch actuation part 98 prestressed by a spring subsequently moves outwardly into the position shown in Figure 5 with the switch 96 becoming closed whereby the electric circuit of the signal generator and transmission circuit 92 is closed.

If the circuit 92 is supplied with power, first a high-frequency carrier frequency is generated by an oscillator 104. The carrier signal is subsequently modulated with the aid of a low-frequency signal which is formed by a low-frequency oscillator 106 in a modulator 108. The low-frequency signal and the carrier signal are subsequently amplified with the aid of an amplifier 110 and supplied to the transmission device or antenna 94, which outputs the signal acquired by the signal receiving device 72.

When downhill skiing or when not using the skis the skier can sometimes wish that the transmission device is made ineffective and this is achieved through a latching switch 112. The latching switch 112 is actuated manually and can be brought by the skier into an open or closed position thereby that a latching switch actuator 114 (Figure 5) is pressed, which is located in one of the ski poles. When the skier has completed the downhill run, he only moves the latching switch actuator 114, such that the latching switch 112 is closed, which readies the receiving device for operation when the switch actuation part 98 is enabled by the skier. The latching switch actuation 114 can have light or another system, through which the position of the latching switch 112 is indicated to the skier.

The transmission device 22, as does the receiving device 24, comprises normal commercially available components, which do not need to be explained further.

To reduce the possibility that through the transmitter of a skier the binding of another skier is disengaged, if both skiers employ the described safety binding, the high-frequency transmitter is developed such that it transmits only over a very short distance, for example a few decimeters, such that between the skiers a spatial distance exists. Moreover, the transmitting device and the receiving device can be developed such that they output and acquire a special highly specific frequency and it would be possible to employ different frequencies for different systems. The transmitting device and the receiving device can also be developed such that they employ different modulation frequencies. For this reason, it is difficult in the case of such a combination that through the signal of one skier the binding of another skier are disengaged.

Up to this point in the specification a remotely disposed actuation device with a high-frequency connection member has been described. However, it is reasonable for a person skilled in the art to employ instead other types of wireless, remote actuation systems. For example, a low-frequency connecting part or a low-frequency connecting system for the output of a low-frequency signal in the sonic range for the release of bindings can be employed.

Such a configuration would be installed in the system like a high-frequency connection part, and a corresponding circuit diagram is depicted in Figures 12 and 13, which will be described in further detail in the following.

In Figure 12 a low-frequency transmitter 115 is shown, which can be installed into the ski pole. The low-frequency transmitter includes a power source 117, which comprises batteries of suitable size and which is connected in series with a sound oscillator 119 and a loudspeaker 121. The skier initiates the formation of a sound signal thereby that he closes the circuit thereby that he closes the latching switch 112 such that an enabling of the actuation part 98 closes the switch 96, whereby to the

low-frequency oscillator 119 energy is supplied. By the low-frequency oscillator 119 a low-frequency signal is generated and transmitted to the loudspeaker 121. A low-frequency (audio) signal is acquired by the low-frequency receiver 123, which is disposed on the skis 14 in the same configuration as the receiver 24 for a high-frequency connection. The low-frequency receiver 123 comprises a microphone 125, which acquires the low-frequency signal of loudspeaker 121 and supplies this signal to the low-frequency amplifier and filter 127. The low-frequency amplifier and filter 127 amplifies the low-frequency signal and filters out the undesired frequencies and conducts the desired frequencies to a detector 129. The signal is rectified by the detector 129 in order for a suitable signal to be obtained for the actuation of a power switch 82. If, as a consequence of acquiring a signal from the detector 129, the power switch 82 assumes a closed position, for the energy source 131 a circuit is closed, whereby suitable batteries are connected with a coil 62. The energy source 131 feeds also the amplifier 127 and the detector 129. With the actuation of coil 62 the binding is opened in the same manner as has been described earlier in connection with the high-frequency configuration.

Up to this point the specification relates to the application of the release system in modern step-in safety bindings. However, it can also be employed with slight modification in other types of bindings, such as, for example, in the older cable bindings, which are still in use. The application in cable bindings is also depicted in Figures 6 to 9. In the description of the cable safety bindings the same reference numbers are utilized for the structures, which were used with the step-in front jaw and heel safety binding earlier, however, with a prime (') being used in each instance.

Conventional cable safety bindings 120, which are also depicted in the drawings, comprise a cable loop 122, which extends about the length of boot 18' and which is suspended into a connection part 124, from which a single cable 126 extends up to a swivellable latching lever 128. The cable binding is actuated thereby that the foot is moved forward until the front end abuts a fixed stop 130 and the cable loop 122 is

subsequently placed about the heel of boot 18'. The latching lever 128 is subsequently swivelled in the counterclockwise direction, as is evident in Figure 6, in order for the cable to be pulled tightly about the heel of boot 18', whereby boot 18' is fastened on ski 14'. On the latching lever 128 is disposed a spring 130, which in this embodiment exerts an effect such that it maintains in cable 126 a certain tension and that it exerts a pressure onto rod 36' in the same manner as spring 50 in the embodiment according to Figure 1. The rod 36 [sic '] under prestress is latched through a latching system 38', which operates in the same manner as the latching system 38, with a plate 28' being secured against movement until the skier initiates a signal via the transmitting device 24 [sic '].

If the skier initiates the generation and transmission of a high-frequency or a low-frequency signal, a coil 62' is actuated, whereby rod 36' is released, which shifts the plate 28', as can be seen in Figure 6, downwardly, whereupon the cable 122 becomes slack and boot 18' can be released from ski 14'.

A release system for an actuatable and practical safety ski binding was described, with which safety bindings released due to force can be modified such that a skier can himself free himself from the bindings while the disengagement properties based on forces of the currently available bindings are maintained.

The term "sound signals" includes ultrasound signals.

Patent Claims

1. Release system for ski bindings with a mechanical clamp-in system with which the ski can be releasably clamped on the boot of a skier,
characterized by
a receiving device (24, 123) disposed on the ski, which responds to a transmitted release signal by releasing the clamp-in system (10, 12, 24, 26; 120, 128, 24'), and by a transmitting device (22, 115), which is provided spaced apart from the receiving device (24, 123) and is disposed such that it can be actuated by the skier and upon actuation outputs the release signal.

2. Release system as claimed in claim 1,
characterized in that
the clamp-in system comprises a connection part (26, 120) which is mechanically connected such that it displaces a ski boot engagement part (16, 122) of the clamp-in system upon acquiring a release signal and releases it.

3. Release system as claimed in claim 2,
characterized in that
the ski boot engagement part of the clamp-in system is a safety front jaw (16).

4. Release system as claimed in claim 2,
characterized in that
the ski boot engagement part of the clamp-in system is a cable safety binding part (122).

5. Release system as claimed in claim 3 or 4,
c h a r a c t e r i z e d i n t h a t
the safety bindings (16 or 122) through [sic: are] bindings to be disengaged and that the connection part (26; 120) responds to the release signal by releasing the bindings (16 or 122) independently of the force release effect of the bindings.

6. Release system as claimed in one of claims 2 to 5,
c h a r a c t e r i z e d i n t h a t
the connection part (26; 120) is connected with an externally actuated latching bar (58; 58'), which executes a swivel movement upon a release signal, whereby a spring-loaded rod (36; 36') is released, which is connected with the ski boot engagement part of the clamp-in system.

7. Release system as claimed in claim 6,
c h a r a c t e r i z e d i n t h a t
the clamp-in system (10, 12, 24, 25; 120, 128, 24') comprises a coil (62; 62'), which is connected with the latching bar (58; 58') and that the receiving device (24; 123) comprises a receiving circuit for actuating the coil (62; 62') which comprises a signal acquisition device (72, 125), a processing circuit (74 to 78; 127, 129) for processing the signal of the acquisition device (72, 125), an energy source (84; 131) and a switch device (82), which upon acquiring the release signal through the signal processing circuit (74 to 78; 127, 129) becomes active in that it connects the energy source (14, 131) with the coil (62; 62').

8. Release system as claimed in claim 7,
c h a r a c t e r i z e d i n t h a t
the receiving device (24; 123) comprises a manually actuatable switch (86), which is actuatable when it is opened for the interruption of the circuit between energy source (84) and coil (62; 62').

9. Release system as claimed in one of the preceding claims,
characterized in that
the transmitting device (22; 115) comprises a transmitting circuit (92, 119) for the generation, processing and the transmission of the release signal and that a switch configuration (96, 112) to be actuated manually is usefully provided such that it can be actuated for exciting the transmitting circuit (92) by the skier.

10. Release system as claimed in claim 9,
characterized in that
the transmitting device (22; 115) is disposed in a ski pole (102) and that the switch configuration to be manually actuated comprises a first switch (96) to be manually actuated, which comprises an actuation part (98), which through the prestress force of a spring projects from a grip (99) on the ski pole (102) such that if a skier grasps the grip (99) with his hand, the actuation part (98) is moved into the pole (102), whereby the first switch (96) to be actuated manually is opened and, upon the release of the grip (99), the actuation part (98) can project again, whereby the first switch (96) to be manually actuated is closed.

11. Release system as claimed in claim 10,
characterized in that
the switch configuration to be actuated manually further comprises a second switch (112) to be actuated manually, which comprises an actuation part (114) which projects from another part of the ski pole (102), which is less readily reachable by the hand of the skier that the first switch (96) and which is movable between a closed position, in which the second switch (112) to be actuated manually is closed, whereby the transmitting circuit (92) can assume its operation if the first switch (96) to be actuated manually is closed, and between an open position, which prevents the actuation of the transmitting

circuit (92).

12. Release system as claimed in one of the preceding claims,
characterized in that
the receiving device comprises a high-frequency receiver (24), which acquires the transmitted release signal which is a high-frequency signal and that the transmitting device comprises a high-frequency transmitter (22), which forms the high-frequency signal and transmits it.

13. Release system as claimed in one of claims 1 to 11,
characterized in that
the receiving device comprises a sound or sonar receiver (12), which acquires the output release signal, which is a sound or sonar signal, and that the transmitting device (115) forms sound or sonar signals and transmits them.

Figure 10

104 High-frequency oscillator
108 Modulator
110 Amplifier
106 Low-frequency oscillator
90 Current source

Figure 11

74 High-frequency amplifier and filter
76 Demodulator
78 Low-frequency filter
80 Detector (Rectifier)
82 Power switch
84 Current source
62 Coil

Figure 12

117 Current source
119 Low-frequency oscillator
121 [unlabeled] loudspeaker

Figure 13

125 [unlabeled] microphone
127 Low-frequency amplifier and filter
129 Detector
131 Energy source
82 Power switch
62 Coil